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AUGUST, 1909

The western American birches

BERTRAM T. BUTLER

The present paper aims to define and characterize the birches of western North America, about which very little has heretofore been written and which have been in more or less confusion as to their identification. After several seasons' work in the field and with the collections in the herbarium of the New York Botanical Garden and those of the College of Pharmacy, Columbia University, I have concluded that the birches of the West are mostly distinct from those of the East, only a few of the eastern species reaching the regions west of the Great Plains. The idea maintained by many writers of regarding the western forms as varieties or even as hybrids of eastern species has no scientific basis, the majority of the confusing varieties and hybrids having been proposed rather as a conjecture based upon a few superficial characters, and without proper study of living material or understanding of habitat and distribution.

While several of the species as described below show considerable variation, it seems more practical to group about a leading type all forms that cannot be clearly characterized than to give them varietal rank. Forms sufficiently distinct to warrant recognition have been regarded as species.

The illustrations are from drawings by the author and give in each instance the typical leaf-form, actual size, outline of the fruiting ament, actual size, and outline of the fruiting bractlet enlarged four diameters. Western forms have been given in cases where the type is from the East or the Middle West.

[The BULLETIN for July, 1909 (36 : 353–420. *pl. 25*) was issued 14 Au 1909.]

The following key recognizes seventeen species. About these types as characterized may be grouped all the western forms known to me at the present time.

Key to the western American birches

Bark separable into layers or sheets, the very thin outer layer peeling into small shreds; trees.

Bark chalky white or silvery gray.

Leaves broadly ovate, apex acute, base mostly subcordate, teeth spreading; twigs glabrous or slightly puberulent; bark silvery gray, often dark; middle lobe of bractlet acute, slightly longer than the rounded lateral ones. 15. *B. subcordata.*

Leaves narrowly ovate, apex long-acute or acuminate, base rounded or cuneate, teeth directed toward apex; twigs pubescent; bark chalky white; middle lobe of bractlet narrow, rounded, about twice as long as the acute or obtuse lateral ones. 14. *B. papyrifera.*

Bark yellowish or reddish-brown, often very dark.

Twigs very glandular; middle lobe of bractlet triangular, acute, much longer than the obliquely ovate or rhombic, spreading, lateral ones.

Leaves ovate, very thin, dark green, apex acute, finely and irregularly doubly serrate with slender long-pointed teeth. 16. *B. occidentalis.*

Leaves deltoid or ovate, thick, bronze-green, apex long-acuminate, coarsely serrate. 13. *B. alaskana.*

Twigs not or but slightly glandular, middle lobe of bractlet rounded, equaling or but slightly longer than the rounded ascending lateral ones.

Leaves broadly ovate, apex acute, base cuneate. 10. *B. kenaica.*

Bark not separable into layers, outer bark not peeling into shreds; trees and shrubs.

Twigs and branchlets glandular-resiniferous, not hairy.

Samara wings broader than the nutlet.

Lateral lobes of bractlets spreading, obliquely ovate, auricled at the base; trees.

Leaves very thin; fruiting ament narrowly cylindrical, elongated, less than 1 cm. thick; lateral lobes of bractlet obtuse or rounded, claw much shorter than middle lobe. 12. *B. Piperi.*

Leaves thick; fruiting ament broadly cylindrical, stout, 1 cm. or more thick; lateral lobes of bractlet mostly acute, claw as long as middle lobe. 11. *B. utahensis.*

Lateral lobes of bractlets ascending, obliquely rhombic, not auricled at the base; shrubs or trees.

Shrubs or small shrub-like trees; bark shining, dark red-brown, smooth; leaves broadly ovate, less than 4 cm. long except on young vigorous shoots, coarsely and irregularly serrate, thin, dark green, apex obtuse or acute, base mostly rounded; twigs densely glandular-resiniferous. 9. *B. fontinalis.*

Trees, often very large, never shrub-like; bark dull ashy gray or dull brown, flaked with gray, roughened; leaves ovate, somewhat lobed, 4–7 cm. long (or more on vigorous shoots), finely serrate, thick, dull bronze-green, apex acute, never obtuse or rounded, base mostly truncate; twigs but slightly glandular-resiniferous. 17. *B. montanensis.*

Samara wings not broader than the nutlet; shrubs.

Leaves crenate-serrate, obovate to orbicular, very resinous, less than 3 cm. long, apex rounded, base mostly cuneate, never cordate. 1. *B. glandulosa.*

Leaves irregularly serrate, broadly ovate or oval, slightly or not resinous, more than 3 cm. long, apex acute with cordate base, or apex obtuse with cuneate base. 3. *B. Hornei.*

Twigs and branchlets more or less hairy or pubescent, not or sparingly glandular-resiniferous, often glabrous; shrubs or shrub-like trees.

Samara wings broader than the nutlet.

Leaves oval or rhombic-ovate.

Leaves narrowly oval or rhombic-ovate, 6 cm. long or less, sharply serrate or dentate, apex acute, base cuneate; twigs finely pubescent, not glandular; middle lobe of bractlet triangular, obtuse, lateral lobes rounded, obliquely rhombic; fruiting ament 2–4 cm. long. 8. *B. Sandbergi.*

Leaves broadly oval, less than 4 cm. long, acute at both ends, serrate or crenate-serrate; twigs pubescent and sparingly glandular; middle lobe of bractlet rounded, as broad as or broader than the ascending rounded lateral ones; fruiting ament less than 2 cm. long. 4. *B. Elrodiana.*

Leaves obovate.

Leaves obovate, apex rounded, base cuneate; twigs puberulent, with long coarse scattered hairs, sparingly glandular; middle lobe of bractlet acute or obtuse, narrower than the spreading, obliquely rhombic, acute lateral ones; fruiting ament 2–3 cm. long. 5. *B. obovata.*

Samara wings not broader than the nutlet.

Leaves finely crenate or crenate-serrate.

Leaves oval, acute at both ends, less than 3 cm. long; twigs glabrous, puberulent at first, slightly glandular; fruiting ament less than 2 cm. long. 7. *B. crenata.*

Leaves obovate, apex rounded, base cuneate; twigs pubescent, not or slightly glandular; fruiting ament 3–4 cm. long, slender. 6. *B. Hallii.*

Leaves coarsely serrate.

Leaves obovate, apex acute or obtuse, base cuneate; twigs glandular-resiniferous, with long coarse scattered hairs; fruiting ament 1–2 cm. long. 2. *B. glandulifera.*

1. BETULA GLANDULOSA Michx. Fl. Bor.-Am. **2**: 180. 1803

A low shrub 1–2 m. high or procumbent at high elevations; twigs and branchlets coarse, reddish brown to gray, densely glandular-resiniferous but not hairy or pubescent; leaf-blades 1–2.5 cm. long, broadly obovate to orbicular, often wider than long, with rounded apex and mostly cuneate base, finely crenate or crenate-serrate, reticulated, with the veins often impressed above, glabrous, often thickly dotted with minute resinous glands; petioles reddish, 2–10 mm. long; fruiting aments 1–2 cm. long, 4–5 mm. thick, cylindrical; bractlet 4–6 mm. long, finely ciliate and puberulent, about equally 3-lobed, lateral lobes ascending, rounded, nearly as long as the rounded middle lobe; samara nearly orbicular, about 2 mm. broad, the wings very narrow. [FIGURE 1.]

This species is readily distinguished by its densely glandular-resiniferous twigs and branchlets and the small rounded crenate or crenate-serrate leaves. It ranges from California to Alaska and eastward throughout the Rocky Mountains, across the continent to the north. The eastern forms differ slightly from those of the west.

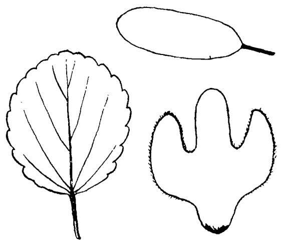

FIGURE 1. *Betula glandulosa* Michx. From *F. E. & E. S. Clements 315*, Ruxton Park, Colorado.

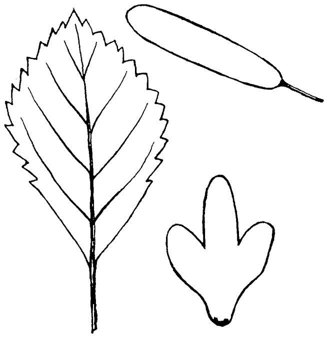

FIGURE 2. *Betula glandulifera* (Regel) Butler. From *B. T. Butler 305*, Rost Lake, Montana.

2. **Betula glandulifera** (Regel) sp. nov.

Betula pumila glandulifera Regel, Bull. Soc. Nat. Moscou **38**: 410. 1865.

A low shrub 1–2 m. high; branchlets very slender, reddish brown, shining, slightly glandular-resiniferous with long coarse scattered hairs, never pubescent, becoming smooth and gray; leaf-blades 2–5 cm. long, 1–3.5 cm. wide, obovate to suborbicular, with mostly acute, sometimes obtuse or rounded apex and cuneate base, often ovate on young shoots, smooth, thick, shining, dark green, serrate to crenate-serrate, often doubly serrate, with broadly triangular teeth 2–5 mm. broad at the base, strongly reticulated, hairy on basal margin and along veins beneath when young, sometimes pubescent on young shoots, thickly covered beneath with minute resin-dots; petioles 3–8 mm. long; fruiting aments 1.5–2 cm. long, 3–5 mm. thick, erect, cylindrical; bractlets puberulent, lobes about equal in width, the middle obtuse or truncate, longer than the ascending or slightly spreading rounded lateral ones; samara wings much narrower than the oval or ovate nutlet. [FIGURE 2.]

This species is distinguished by the coarse hairs upon the slightly resinous branchlets and the obovate, coarsely toothed leaves, which are strongly resin-dotted beneath. It is more closely related to several other forms than to *Betula pumila*, an eastern species not reaching the Rocky Mountain region, of which it has been considered a variety. It ranges from Oregon and British Columbia eastward to Michigan and Western Ontario. The specimens from the Middle West have bractlets with somewhat narrower lobes.

3. **Betula Hornei** sp. nov.

A shrub 1–2 m. high, glabrous; twigs and branchlets dark purplish-brown, glandular-resiniferous; older stems with thin gray easily removed coating; leaf-blades up to 4 cm. long and nearly or quite as wide, thick, dark bronze-green, yellowish below, broadly rhombic or ovate, with acute or obtuse apex and cordate or subcuneate base, sometimes lobed, irregularly crenate-serrate, often doubly serrate, with mostly coarse teeth, strongly reticulated, with 4 or 5 pairs of veins impressed above and conspicuous below, resin-dotted; petioles purple-tinged, 10–15 mm. long, glabrous; fruiting aments about 15 mm. long, 8–10 mm. thick, oval, glabrous, the stalk about 10 mm. long; bractlets about 5 mm. long and 4 mm. wide, lobes about equal in width, the middle lobe obtuse, the lateral obliquely ovate or rhombic, acute above, ascending, glabrous; samara about 3 mm. wide and as long; nutlet obovate with cuneate base, wing narrower than nutlet. [FIGURE 3.]

Type collected by W. T. Horne at Karluk, Alaska, in August, 1902, and reported as rare. Gorman's *no. 1195*, collected at White River, Yukon Territory, near timber line, is probably the same.

This is closely related to *Betula glandulosa* and *B. fontinalis*, differing from both in its fruit and leaves and from the latter also in habit of growth. Type in the herbarium of the N. Y. Botanical Garden.

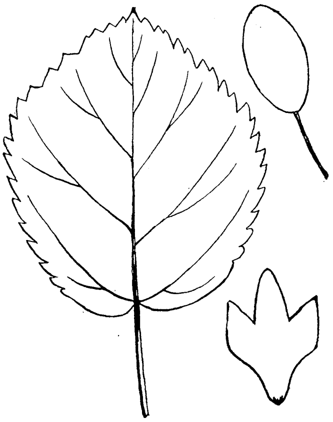

FIGURE 3. *Betula Hornei* Butler. From type, *W. T. Horne*, Karluk, Alaska.

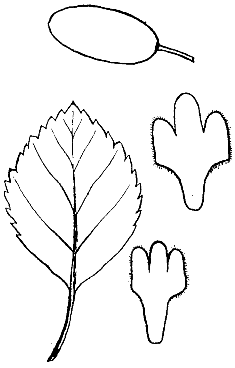

FIGURE 4. *Betula Elrodiana* Butler. From type, *B. T. Butler 309*, near Rost Lake, Montana.

4. **Betula Elrodiana** sp. nov.

A low shrub; stems glabrous, shining, red-brown or dull gray; twigs and branchlets slender, red-brown or gray, pubescent, sparingly glandular-resiniferous, becoming glabrous; leaf-blades 1–3 cm. long, 1–2 cm. wide, oval or rhombic, rarely ovate or obovate, often suborbicular, with acute, sometimes obtuse apex, and rounded, obtuse, or cuneate, and entire base, crenate-serrate with ovate teeth 1–4 mm. wide at the base, shining dark-green above, reticulated, dull green beneath, glabrous except for a few hairs on the basal margin and along the venation above and beneath, venation not conspicuous, 3–5 pairs of veins; petioles pubescent, pale brown or green, 5–10 mm. long; fruiting ament 10–15 mm. long, 6–8 mm. thick, cylindrical or oval on a slender stalk 3–8 mm. long; bractlet puberulent and ciliate, 3–5 mm. long, about 3 mm. wide, claw long, cuneate, lobes rounded, about equal in width, the middle usually but a little longer than the ascending lateral ones ; samara 3–4 mm. wide, the wings much wider than the narrowly oval nutlet. [FIGURE 4.]

Type, *B. T. Butler 309*, from a swamp near Rost Lake, Montana, — in herbarium of the N. Y. Botanical Garden.

This has been determined as *Betula pumila*, from which it differs in having less pubescent, more or less glandular branchlets ; nearly glabrous, never pubescent, oval leaves ; bractlets differing in size and form ; and in the broadly winged samaras. It is abundant in the type locality, forming small clumps about the swampy borders of small ponds and lakes in the eastern Flathead Valley.

It is with pleasure that the name of Dr. Morton J. Elrod, well known in connection with the natural history of the Flathead region of Montana, is given to this distinct species.

5. **Betula obovata** sp. nov.

A rather coarse shrub with rough dull gray bark and very small inconspicuous lenticels ; branchlets slender, puberulent, but not hairy excepting a few scattered long hairs occasionally on young shoots, sparingly glandular-resiniferous, red-brown, becoming gray ; leaf-blades 2–4 cm. long, 1.5–3.5 cm. wide, thick, firm, dark, shining and reticulated above, paler and dull green beneath, obovate, serrate or crenate-serrate with irregular teeth 1–4 mm. wide, apex rounded, base cuneate, venation coarse and conspicuous, veins 5 or 6 pairs, surface pubescent beneath especially along midrib and veins, often with longer scattered hairs on basal margin and along midrib, minute resin-dots beneath ; petioles reddish brown, pubescent or with coarse hairs, 5–10 mm. long ; fruiting ament cylindrical or oval, obtuse at each end, 2–2.5 cm. long, 6–8 mm. thick, stalk 6–8 mm. long ; bractlets puberulent, ciliate, 3–5 mm. long, 2–3 mm. wide, middle lobe long-ovate or triangular, obtuse or subacute, lateral lobes obliquely rhombic or ovate, acute or subacute ; samara 3–5 mm. wide, wing as broad as or mostly broader than the oval or obovate nutlet. [FIGURE 5.]

Type, *B. T. Butler 317*, valley of the Jocko River, Ravalli, Montana, — in herbarium of the N. Y. Botanical Garden.

This species is distinguished by its dark, shining, obovate, coarsely serrate leaves, rounded at the apex, and the broad-winged samaras. The fruit resembles that of *Betula fontinalis*, while the leaves and branchlets resemble those of *B. glandulifera*. The latter has leaves mostly acute at the apex and the branchlets are more resinous and more hairy. In *B. obovata* the branchlets are mostly glabrous with occasionally a very few coarse hairs.

6. BETULA HALLII Howell, Fl. N. W. America **1**: 614. 1902

A shrub 1–3.5 m. high with ashy gray branchlets; twigs finely pubescent to velvety-pubescent, sparingly glandular-resiniferous; leaf-blades about 4 cm. long and 2.5 cm. wide, obovate, with rounded apex and cuneate base, crenate to crenate-serrate with fine teeth, green and glabrous on both sides, with very numerous minute resin-dots beneath; petioles short, sometimes with a few scattered hairs; fruiting aments about 4 cm. long and 5–6 mm. thick, very slender; bractlets about 4 mm. long and 3 mm. wide, glabrous, the lobes narrow, obtuse or truncate, usually of about equal length and width; samara 1–2 mm. wide, wing narrower than the oval or obovate nutlet. [FIGURE 6.]

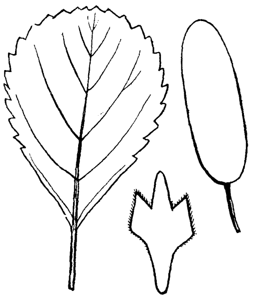

FIGURE 5. *Betula obovata* Butler. From type, *B. T. Butler 317*, Ravalli, Montana.

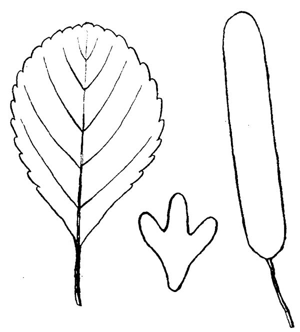

FIGURE 6. *Betula Hallii* Howell. From *E. Hall 469*, Lake Labish, Oregon.

The above description is based on Elihu Hall's *469* from Lake Labish, Marion Co., Oregon. Howell cites the above locality but gives no herbarium number. One would infer that the above number of Hall's would be at least a cotype. Howell describes the leaves as finely serrate but in all specimens I have examined they are more nearly crenate. H. Winkler in Das Pflanzenreich, 4^{61}: 72. 1904, gives the above number as *Betula pumila setarioides* Winkler.

It is distinguished by the long slender fruiting aments; glabrous, mostly finely crenate leaves; and pubescent, glandular-resiniferous branchlets. The samaras are like those of *Betula pumila* and *B. glandulifera* in being narrow-winged but the elongated fruiting aments and finely crenate glabrous leaves at once distinguish it from these species. It ranges from Oregon northward to Alaska and Yukon Territory.

7. **Betula crenata** Rydb. Ms., sp. nov.

A shrub 2.5–4.5 m. high, with dark brown or nearly black bark, branches only sparingly glandular-resiniferous, puberulent or glabrous and reddish at first; leaf-blades 1–3 cm. long, 8–20 mm. wide, slightly pubescent at first, resinous, glabrous when older, oval or elliptical, acute at both ends, crenate or crenate-serrate with very small teeth, shining dark green and reticulate-veined above, with 4 or 5 pairs of very delicate and inconspicuous veins, yellowish green beneath with minute resin-dots; petioles 5–10 mm. long; fruiting aments 12–18 mm. long, about 6 mm. thick, cylindrical; bractlets glabrous, about 4 mm. long and 3 mm. wide, middle lobe short-oblong or elliptic, obtuse or rounded at the apex, lateral lobes ascending, obliquely ovate or rhombic, obtuse; samara about 2 mm. wide, wings as wide as or narrower than the nutlet. [FIGURE 7.]

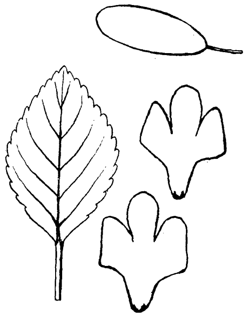

FIGURE 7. *Betula crenata* Rydb. From type, *D. T. MacDougal 665*, near Rost Lake, Montana.

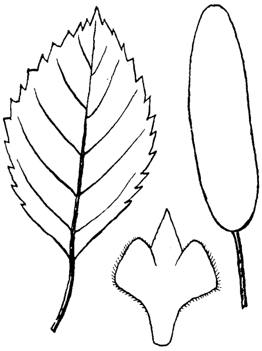

FIGURE 8. *Betula Sandbergi* Britton. From *B. T. Butler 365*, near Rost Lake Montana.

The species is distinguished by the glabrous oval or elliptical finely crenate leaves and the narrow-winged samara. It resembles *Betula Elrodiana* in size and outline of the leaf but the coarse serrate teeth of the latter readily separate the two. The type is D. T. MacDougal's *665*, collected near Rost Lake, Montana, and is apparently rare.

8. BETULA SANDBERGI Britton, Bull. Torrey Club **31**: 166. 1904

A shrub or shrub-like tree with dark reddish-brown bark, not separable into layers; lenticels not conspicuous; branchlets finely pubescent but not glandular-resiniferous, coarse, greenish, becoming gray and red-brown, covered with a bluish bloom; leaf-blades up to 6 cm. long in the type specimen, 3–4 cm. in the Rocky Mountain form and 12–22 mm. wide, thick, firm, dull bronze-green above, paler and sparsely hairy beneath, slightly resinous, rhombic-ovate or oval, acute at both ends, margins somewhat thickened, coarsely and irregularly serrate or dentate, veins 4 or 5 pairs; fruiting aments 2–3 cm. long, slender-stalked; bractlets about 4 mm. long, nearly as wide, pubescent, middle lobe mostly triangular, obtuse or acute, longer than the ascending, rounded, lateral ones; samara 3–5 mm. wide, wings broader than the more or less puberulent nutlet. [FIGURE 8.]

This small tree-like birch is readily distinguished by its coarse thick rhombic leaves and pubescent, often glabrous, but not glandular-resiniferous branchlets. It frequents swampy places and resembles *Betula fontinalis* in habit and growth but is readily distinguished from that species by the leaves and branchlets. The leaves are larger and more coarsely toothed than those of *B. Elrodiana*, the bractlets and fruiting aments are quite different, and the latter remains a low shrub, not assuming a tree-like form.

The type locality is Hennepin Co., Minnesota. It has been found in Saskatchewan and in Montana, being apparently rare.

9. BETULA FONTINALIS Sarg. Bot. Gaz. **31**: 239. 1901

Shrub-like, forming clumps similar to those of some of the willows and reaching from four to eight meters in height, often assuming tree-like proportions; bark smooth, shining dark reddish-brown or bronze with pale conspicuous lenticels, not separable into layers or peeling on the surface; branchlets densely glandular-resiniferous, slender, graceful, somewhat pendulous; leaf-blades 2–4 cm. long and nearly or quite as wide, often larger on sturdy young shoots, broadly ovate to suborbicular, with acute apex and mostly rounded base, sharply and often doubly serrate, thin, firm, bright green, resinous, with 3–5 pairs of slender veins; fruiting aments 2–3 cm. long, 5–10 mm. thick; bractlets pubescent, ciliate, middle lobe acute, narrowly triangular, much longer than the ascending, acute, obliquely rhombic lateral ones ; samara wings much wider than the ovate or obovate puberulous nutlet. [Figure 9.]

This is one of the most common birches of the West, being found throughout the Rocky Mountain region and readily distinguished by its densely resinous slender branchlets, its smooth, shining reddish bark and small broadly ovate acute shining leaves. It is often called cherry birch and has been confused with *Betula occidentalis* through a mistake of Hooker's (Fl. Bor.-Am. **2** : 155) in confusing the large western tree form with this, which is usually small and shrub-like, forming clumps like willows along streams. Sargent's explanation (Bot. Gaz. **31** : 239) is doubtless correct and his name for the species very aptly chosen.

10. Betula kenaica Evans, Bot. Gaz. **27** : 481. 1899

A tree up to 13 m. in height with thin dark brown bark separable into layers ; twigs glandular-resiniferous, though not densely so, red-brown and shining ; leaf-blades about 6 cm. long, nearly as wide, ovate, slightly hairy when young, soon becoming glabrous, dull dark green above, paler beneath, acute at apex, obtuse or nearly truncate at base, sharply, coarsely, and irregularly serrate,

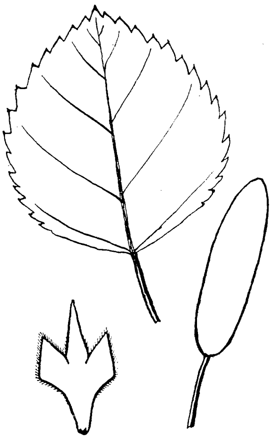

Figure 9. *Betula fontinalis* Sarg. From *B. T. Butler 327*, near Helena, Montana.

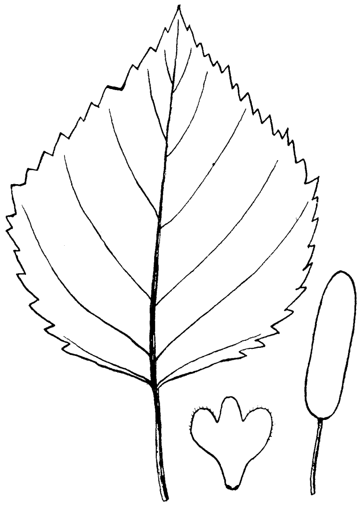

Figure 10. *Betula kenaica* Evans. From *C. V. Piper 4480*, Kenai, Alaska.

with abruptly tipped teeth, veins 4 or 5 pairs; petioles 15–25 mm. long; fruiting aments about 2 cm. long, 5 mm. thick; bractlets about 3 mm. long, ciliate, the middle lobe rounded, slightly narrower and as long as or but slightly longer than the erect rounded lateral ones; samara wings about as wide as the small oblong nutlet. [FIGURE 10.]

This is an Alaskan species found along the northwestern coast and locally known as red or black birch. It resembles *B. fontinalis* but has larger, more coarsely serrate leaves, less resiniferous branchlets, separable bark, and entirely different fruiting aments and bractlets.

11. BETULA UTAHENSIS Britton, Bull. Torrey Club **31**: 165. 1904

A small tree with dark yellowish-brown or bronze bark, not separable into layers, lenticels pale gray and rough; twigs and branchlets slender, more or less densely glandular-resiniferous, greenish- or reddish-brown, becoming very dark brown or gray,

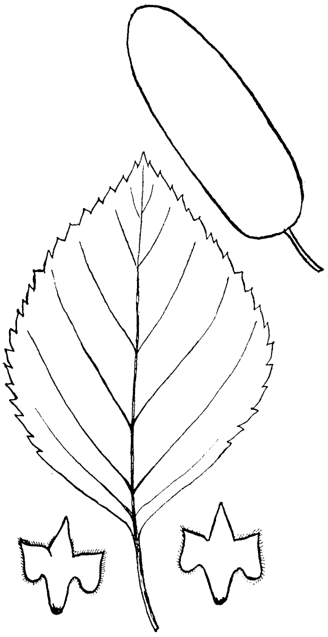

FIGURE 11. *Betula utahensis* Britton. From type, *S. G. Stokes*, City Creek Canyon, Salt Lake City, Utah.

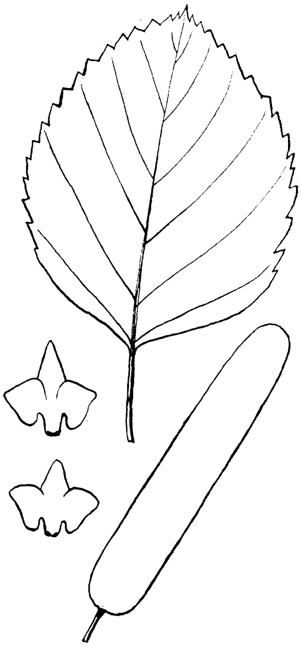

FIGURE 12. *Betula Piperi* Britton. From type, *C. V. Piper 3527*, near Pullman, Washington.

often with a few scattered hairs; leaf-blades 3–6 cm. long, broadly ovate to suborbicular, with acute apex and rounded to cuneate base, sharply dentate with abruptly tipped teeth, hairy at first, becoming glabrous except along veins beneath and on basal margin, veins 5 or 6 pairs; fruiting aments cylindrical, stout, 3–4 cm. long, 8–12 mm. thick; bractlets 4–5 mm. long, nearly as wide, the middle lobe triangular, acute or obtuse, the lateral lobes obliquely ovate or rhombic, acute, widely spreading, distinctly auricled at the base; samara wings broader than the oval or obovate nutlet. [FIGURE 11.]

The bractlets resemble those of *Betula Piperi*, differing in the more rhombic acute lateral lobes, which are more spreading and broadest at the base, the claw being much longer. The leaves resemble those of *B. fontinalis* but are larger, thicker and more cuneate. The species occurs in the Flathead region, Montana, but with this exception is not known outside of the type locality near Salt Lake City, Utah.

12. BETULA PIPERI Britton, Bull. Torrey Club **31**: 165. 1904

A tree up to 15 m. high, with slender, graceful, drooping branches; bark dark brown, not separable into layers, lenticels nearly white; twigs very delicate, slender, greenish brown and glandular-resiniferous, becoming nearly black; leaf-blades 5–6 cm. long and 4–5 cm. wide, ovate or oval, often somewhat lobed, very thin, dark rich green, shining above, very pale and whitish beneath, coarsely, sharply, and irregularly serrate, pubescent at first, becoming glabrous, apex acute, base mostly cuneate; fruiting aments slender, narrowly cylindrical, 3–5 cm. long, about 8 mm. thick; bractlets puberulent and ciliate, the lateral lobes widely spreading, rounded, obliquely ovate, distinctly auricled, the middle lobe triangular, acute or obtuse, the claw very short, cuneate, about equaling the lateral lobes; samara wings usually not wider than the nutlet. [FIGURE 12.]

The type is *no. 3527* of C. V. Piper, collected near Pullman, Washington. I have found several sterile specimens along the Kootenai River in northwestern Montana and also in the Flathead region. The name black birch is aptly applied to it, this color, with the very thin coarsely toothed leaves and the slender fruiting aments with their characteristic auricled, short-clawed bractlets, making it very distinct. It ranges from Oregon and Washington to western Montana.

13. Betula alaskana Sarg. Bot. Gaz. **31**: 236. 1901

A tree reaching a height of 26 m. with bark varying from nearly white to brown, separating more or less freely into layers; branchlets densely glandular-resiniferous; leaf-blades 4–8 cm. long and nearly as wide, triangular-ovate or deltoid, with long acuminate apex and truncate base, coarsely serrate with abruptly pointed teeth, dull dark green above, paler beneath, somewhat hairy when young; petioles 15–30 mm. long, slender; fruiting aments 3–3.5 cm. long, 8–12 mm. thick; bractlets glabrous or puberulous, sometimes ciliate, lateral lobes spreading, wider but scarcely longer than the narrow, triangular, acute middle one; samara wings broader than the small oval nutlet. [Figure 13.]

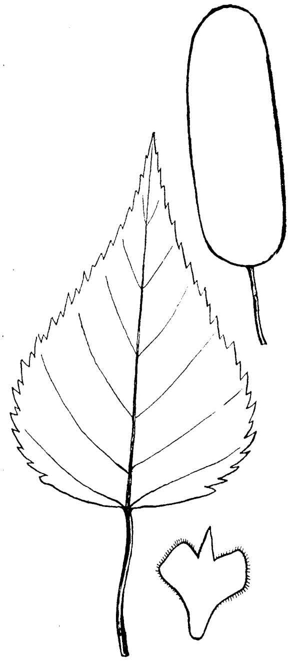

Figure 13. *Betula alaskana* Sarg. From *J. B. Tarleton 138*, Fort Selkirk, Yukon Territory.

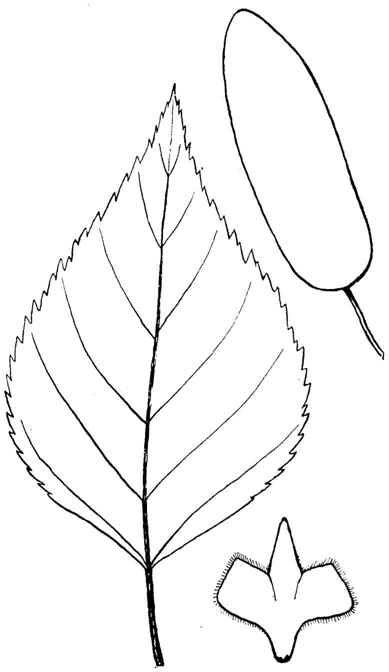

Figure 14. *Betula papyrifera* Marsh. From *B. T. Butler 322*, Big Fork, Montana.

This species is distinguished by the very long-pointed leaves and densely resinous branchlets. All the specimens I have seen have dark brown bark not readily separating into layers and have a very thin superficial outer layer. It is found from the Saskatchewan Valley to the Yukon, being common in the Yukon Basin.

14. BETULA PAPYRIFERA Marsh. Arbust. Am. 19. 1785

B. papyracea Ait. Hort. Kew. **3**: 337. 1789.
B. alba var. or subsp. of Regel and others.

A forest tree 15 to 25 m. high with slender, graceful branches and smooth chalky white bark with large conspicuous brown or yellow lenticels, easily separated into thin paper-like layers, peeling naturally upon the tree into narrow horizontal plates, the exposed red or orange-brown inner bark making a striking contrast to the white, the bark near the base of the tree thicker and rough, nearly black and irregularly furrowed; branchlets more or less pubescent, densely so on vigorous young shoots in the western forms, but not usually resinous-dotted, greenish or light brown at first with paler lenticels, becoming dark shining brown, sparingly hairy or glabrous; leaf-blades 4–8 cm. long, 2–5 cm. wide (or more on vigorous young shoots), narrowly ovate to oval, with acute or acuminate apex, and rounded or cuneate, sometimes truncate, often oblique base, finely or coarsely serrate, sometimes slightly lobed, hairy when young, becoming glabrous, dull bronze-green, mostly free from resin-dots; fruiting aments 2–5 cm. long on slender resinous stalks; bractlets about 5 mm. long, middle lobe narrow, elongated, rounded, lateral lobes more or less ciliated, obliquely rhombic, acute or obtuse, claw short, cuneate; wings of samara broader than nutlet. [FIGURE 14.]

The leaves of the eastern forms of this species are usually densely resin-dotted, the bractlets are mostly glabrous and the bark peels very readily into thin papery layers. The western form usually differs in these respects, the bark often remaining close and firm, peeling only with difficulty and then into small scale-like plates. Nelson describes one of the western forms from Colorado (Bot. Gaz. **43**: 279. 1907) and proposes the name *Betula Andrewsi* should it prove distinct from those of the East. I do not think there is sufficient ground for separating the two. I would not include, however, all the western forms heretofore known as *B. papyrifera*, at least three distinct species having been included under this name, *B. papyrifera* proper, *B. occidentalis*, and *B. subcordata*. The last two are more common in the Rocky Mountain region, *B. papyrifera* being rare and, so far as known, not found west of the Bitter Root Mountains. It ranges from western Montana and Alberta to Colorado and eastward across the continent.

15. **Betula subcordata** Rydb. Ms., sp. nov.

A small tree with silvery gray purple-tinged bark with nearly black lenticels 1–4 cm. long, inner bark pale purple-brown to dark brown, separating with difficulty into shreds but not into sheets, outer bark very thin and semi-transparent, peeling into flakes, the old bark much roughened by peeling into shreds displaying the purplish inner layers; branchlets red-brown, glabrous or slightly puberulent, often covered with a bluish glaucous bloom, becoming brown or gray, usually shining red-brown, with very small, pale conspicuous lenticels and very rarely with minute resinous glands, the older branches red-brown, shining, the lenticels pale, numerous and conspicuous; leaf-blades ovate, 5–10 cm. long, 4–8 cm. wide, with acute apex and rounded to cordate base, thick, dull, bronze-green above, dull and paler beneath, with 5–7 pairs of prominent pale brown, nearly white veins, glabrous above and below except along veins and midrib, rarely slightly pubescent at the base, finely or coarsely serrate with sharp spreading teeth which are mostly ovate with abruptly pointed tips and 2–4 mm. broad at the base; petioles 1–2.5 cm. long, stout, pubescent at first or glabrous; fruiting ament 3–4 cm. long, 6–10 mm. thick, cylindrical or oblong, its stalk more slender than the leaf-petiole, 1–1.5 cm. long, glabrous or slightly resin-dotted; bractlets 6–8 mm. long, 3–4 mm. wide, finely pubescent and ciliate, middle lobe narrow, acute or obtuse, a little longer than the spreading, obliquely rhombic or

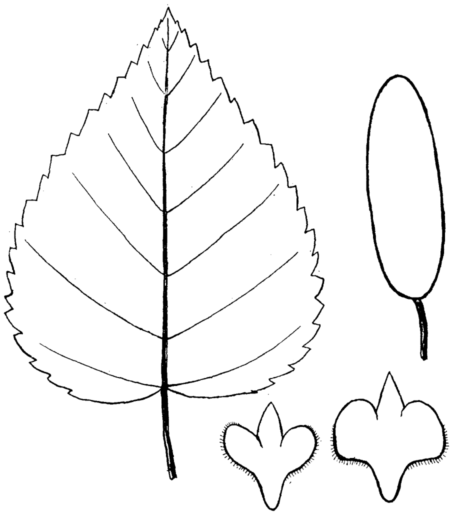

FIGURE 15. *Betula subcordata* Rydb. From type, *J. H. Sandberg 32*, Nez Perces Co., Idaho.

rounded lateral lobes; samara wings mostly broader than the more or less puberulent nutlet. [FIGURE 15.]

The type is J. H. Sandberg's *33* from Hatwai Creek, Nez Perces Co., Idaho. It is common throughout the Rocky Mountains west of the main divide from Idaho and Montana northward into British Columbia and Alberta. It differs from *B. papyrifera* in the color and character of the bark, the form and toothing of the leaves, the character of the bractlets, and in the glabrous branchlets; from *B. occidentalis* in the above characters and also in having thicker dull green leaves. It stands between these species, but is wholly distinct from either. It has also been called *B. cordifolia* Regel, but that species has laciniately cut leaves, which are also larger with usually 8 pairs of veins, slightly lobed, with long-pointed apex and slightly cordate base, petioles and venation hairy, bark white and peeling readily, bractlets quite unlike *B. subcordata* in form and almost glabrous, with lobes all rounded and about equal in width, the middle twice as long as the ascending lateral ones.

16. BETULA OCCIDENTALIS Hook., in part, Fl. Bor.-Am. 2: 155. 1839

A large tree reaching 40 m. in height in the type locality (the region about Puget Sound); bark yellow-brown, orange, or dark bronze-brown, outer layer very thin and peeling into small curling shreds, inner layers varying from pale tan to dark reddish-brown, separable into layers though often with difficulty and not until old; branchlets usually very glandular-resiniferous, sometimes hairy or puberulent, slender, pale brown, becoming dark, glabrous, and lustrous; leaf-blades 6–10 cm. long, 5–6 cm. wide, ovate, with acute or acuminate apex and truncate or rounded, occasionally subcordate or subcuneate base, furnished with 7 or 8 pairs of coarse brown or yellowish veins, doubly serrate with irregular, very slender, long-pointed teeth, slightly lobed, bright green, glabrous, or puberulent beneath, resinous when young, hairy along the venation beneath with tufts of hairs in the vein-axils; petioles 1–2 cm. long, hairy or puberulent, becoming glabrous; fruiting aments 3–4 cm. long, 10–12 mm. thick, cylindrical or oblong, on stout stalks 12–18 mm. long; bractlets ciliate, 5–6 mm. long, 3–4 mm. wide, broadest at the apex of the widely spreading obliquely ovate or rhombic, rounded, lateral lobes, middle lobe elongated, acute, awl-shaped, claw short, cuneate; nutlet oval, nearly as wide as the wings. [FIGURE 16.]

This birch is distinguished by its thin bright green doubly serrate leaves with fine very slender lanceolate-attenuate teeth, curved toward the apex, by the slender, very resinous branchlets, and by the orange or bronze bark with its curling, shreddy, outer layer. It is common along the Pacific Coast region of Washington and British Columbia, reaching eastward to western Montana, where it is found along the Kootenai River and about the shores of Flathead Lake. It is locally known as yellow birch, black birch, and western birch.

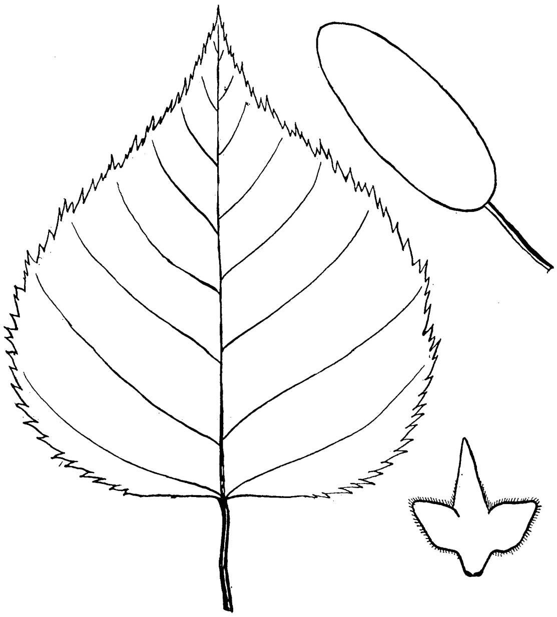

FIGURE 16. *Betula occidentalis* Hook. From *B. T. Butler 339*, Yellow Bay, Flathead Lake, Montana.

17. **Betula montanensis** sp. nov.

A large tree with dark gray or brown bark often mottled with orange or bronze, somewhat roughened but not peeling into shreds or separating into layers, lenticels 2–4 cm. long, inner bark reddish brown, very dark; branchlets red-brown, more or less resinous, becoming ashy gray and much roughed by leaf-scars; leaf-blades 4–6.5 cm. long, 3–5.5 cm. wide, thick and firm, dull bronze-green, glabrous, slightly lobed, ovate, apex acute, base truncate, often subcuneate on young leaves, margins finely serrate with abruptly tipped teeth, veins 6–8 pairs, impressed above, conspicuous and hairy beneath with small tufts of hairs in the axils, lower surface with numerous small resin-dots, the basal margins sometimes hairy; petioles 1–2 cm. long, puberulent, often with a few scattered hairs; fruiting ament 2.5–3.5 cm. long, about 1 cm. thick, cylindrical or narrowly oval, narrowed toward the rounded base and apex, stalks slender, 10–15 mm. long, puberulent and resinous; bractlets puberulent or pubescent, strongly ciliate, 5–7 mm. long, about 3 mm. wide, broadest at the base of the spreading obliquely rhombic, rounded, lateral lobes, middle lobe acute or obtuse, triangular, long and tapering, claw elongated, cuneate; samaras about 4 mm. wide, wings broader than the oval, puberulent nutlet. [FIGURE 17.]

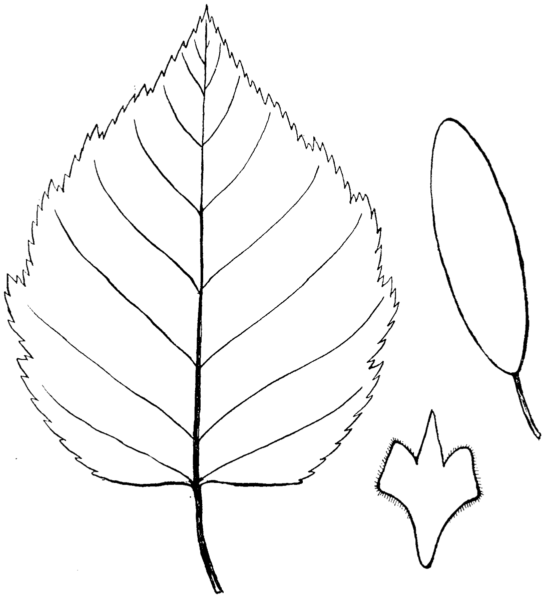

FIGURE 17. *Betula montanensis* Butler. From type, *B. T. Butler 360*, Yellow Bay, Flathead Lake, Montana.

Type, *B. T. Butler 360*, collected at Yellow Bay, eastern shore of Flathead Lake, Montana, and deposited in the herbarium of the N. Y. Botanical Garden.

This is distinguished by its thick dull green somewhat lobed truncate leaves and its non-peeling dark gray bark. In appearance the trunk suggests the alder with its mottled gray and brown slightly roughened bark, which is never shining and smooth as in other birches. In size and shape, the leaves are much like those of *Betula occidentalis* but they are thick and dull and have short teeth. The bark has sometimes the same bronze color but is dull, never peels and is always mottled with gray. The twigs are less resinous, dull, and roughened. The bractlets are also quite different. It may possibly be a hybrid between *Betula occidentalis* and some one of the thick-leaved species. It is apparently not common, being known at present only in the type locality. It is even more distinct in the field than in the herbarium, and not likely to be confused with any other species.

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